NRG Ex. 2.0

STATE OF ILLINOIS

ILLINOIS COMMERCE COMMISSION

Union Electric Company	**:**	
	:	
Verified Petition Seeking Approval of	**:**	**No. 03-0083**
Asset Agreements with Affiliated	**:**	
Company Pursuant to Section 7-101 of	**:**	
the Illinois Public Utilities Act.	**:**	

DIRECT TESTIMONY OF DR. ALEKSANDR RUDKEVICH

ON BEHALF OF

NRG ENERGY, INC.,
NRG POWER MARKETING, INC., and
NRG AUDRAIN GENERATING LLC

Tabors Caramanis & Associates
50 Church Street
Cambridge, Massachusetts, 02138

Dated: April 17, 2003

I.

INTRODUCTION

Q. Please state your name, occupation, and business address.

A. My name is Dr. Aleksandr Rudkevich. I am a Director with Tabors Caramanis & Associates ("TCA"). TCA is an engineering and economic consulting firm specializing in policy development, business planning, technical analysis and project implementation in the energy and utility sectors in the United States and abroad. Our offices are located at 50 Church Street in Cambridge, Massachusetts, 02138.

Q. Please describe your general background in energy systems analysis and modeling.

A. I have over twenty years of experience in energy economics, regulatory policy, strategic planning and modeling of energy markets. My resume, which is incorporated by reference as Attachment 2.1, provides a detailed description of my experience, and specifies my area of expertise and educational background.

Q. Please describe your specific experience with the valuation of generation and transmission assets.

A. Since joining TCA in December of 1998, I have directed and actively participated in over 30 projects dealing with valuation of generation and transmission assets in various areas in North America. These projects have involved valuing new and

existing assets. Our clients include developers of new projects, buyer and sellers of generating assets, regulatory agencies and banks involved in project financing.

Q. What is the purpose of your testimony in this proceeding?

A. TCA has been retained by NRG Energy, Inc. ("NRG"), NRG Power Marketing, Inc., and NRG Audrain Generating LLC (collectively, the "NRG Companies") to evaluate the value of NRG's Audrain generating facility (the "Audrain Facility" or "Audrain") and the values of the Pinckneyville and Kinmundy generating facilities (the "AEG Facilities") Union Electric Company ("AmerenUE") has proposed to purchase from its affiliate Ameren Energy Generating Company ("AEG").

Q. Please summarize your conclusions.

A. My analysis regarding the three facilities, AEG's Pinckneyville and Kinmundy and NRG's Audrain, concludes:

(1) **AmerenUE's proposed purchase price of the Pinckneyville and Kinmundy facilities from AEG is higher than the fair market value of those facilities.** The current market value of the AEG Facilities is substantially below the book value of these generating units. In other words, if the proposed transaction were approved by the Illinois Commerce Commission ("ICC" or "Commission"), AmerenUE would be paying more for these assets than it likely would if it were to enter into an arm's length transaction for those similar facilities.

(2) **On a per kW basis, the market values of the three facilities are virtually indistinguishable.** Market value estimates are summarized in Attachment 2.2, which is incorporated by reference.

(3) **Transmission congestion does not distinguish the three plants.** Analysis of the costs of transmission congestion from each power plant to Ameren's load indicates that the Audrain plant represents a capacity option that is similarly situated to any of the proposed AEG facilities in terms of transmission access. The summary of my analysis of the costs of transmission congestion is incorporated by reference as Attachment 2.3.

Q. Based upon your analysis, what is your recommendation to the Commission?

A. My analysis demonstrates that the book value of the AEG Facilities does not represent a fair market price of those assets. The transaction, as proposed, would result in AmerenUE paying an unreasonably high price for its affiliate's assets. Given the price proposed by AmerenUE in its petition and the price being offered by NRG for its Audrain Facility, AmerenUE's least-cost option appears instead to be the purchase of NRG's Audrain Facility.

Q. How is the balance of your testimony organized?

A. The balance of my testimony consists of the following sections:

II. In this section, I provide an overview of the AmerenUE filings before the Commission and FERC and highlight the fundamental flaws in AmerenUE's testimony;

III. In this section, I describe the model that we used to analyze the facilities; and

IV. In this section, I present the results of our analysis, concluding that AmerenUE's least-cost option appears to be the purchase of NRG's Audrain Facility.

II.

BACKGROUND

Q. Please provide a brief description of the background to this case.

A. On or about February 6, 2003, AmerenUE submitted a petition to the Commission requesting authorization under Section 7-101 of the Illinois Public Utilities Act (the "Act") to transfer a set of generating and associated transmission facilities from AEG to AmerenUE. Around the same time, AmerenUE and AEG submitted an application to the Federal Energy Regulatory Commission ("FERC") for authorization under Section 203 of the Federal Power Act to transfer the FERC jurisdictional facilities associated with the generators from AEG to AmerenUE.

Q. Please describe the generating facilities AmerenUE proposes to acquire from AEG.

A. The AEG Facilities include eight generating units of the Pinckneyville power plant with a total capacity of 316 MW and two generating units of the Kinmundy power plant with a total capacity of 232 MW. Thus, the total capacity that would be added to the AmerenUE system is 548 MW. AEG proposes to sell those

facilities to AmerenUE at the facilities' net depreciated book value which, as of September 30, 2002, was $161.5 million (or $511/kW) for Pinckneyville and $96.4 million (or $415/kW) for Kinmundy.

Q. Please summarize Ameren's filing.

A. In its filing:

- AmerenUE asserted that AmerenUE needs this capacity addition to meet its incremental reserve margin requirements for 2003;
- AmerenUE also asserted that as part of its resource planning in 2001 it conducted an Asset Mix Optimization Analysis to determine the least cost mix of generating assets required to meet its long-term needs. Following recommendations made in that analysis, in the fall of 2001, AmerenUE issued an RFP for capacity and energy with the intent of purchasing up to 500 MW of capacity for the time period between 2002 and 2011. According to AmerenUE, in that analysis it considered alternatives ranging from entering into long-term power purchase agreements, constructing new generating units and purchasing existing generating units both within and outside its control area. AmerenUE asserts that it decided that the best course of action was to purchase existing power plants within its control area. AmerenUE maintains that this is also the preference expressed by the Staff of the Missouri Public Service Commission.
- AmerenUE further asserts that in addition to reviewing the options of buying the AEG Facilities plants, it also assessed the option of purchasing two unnamed power plants within its control area owned by non-affiliated

Independent Power Producers ("IPPs"), as well as other assets owned by AEG. With respect to assets owned by other IPPs, AmerenUE asserts that it decided not to pursue that option due to "concerns about the creditworthiness of the owners of the assets and existing transmission constraints associated with these plants." AmerenUE also asserts that it considered and dismissed the option of purchasing the output from AEG, the Columbia Energy Center, Gibson City Plant and Grand Tower Plant facilities. Thus, AmerenUE asserts that only the AEG Facilities plants remained as "viable" options for AmerenUE.

Q. How did NRG Energy respond to AmerenUE's FERC filing?

A. In response to AmerenUE's FERC filing, on March 28, 2003, NRG filed with FERC a Motion for Leave to File Answer along with an Answer of the NRG Companies. In those documents, NRG stated that:

- NRG Energy has been and continues to be actively attempting to sell its 640 MW Audrain generating facility to AmerenUE;
- Audrain is located within the Ameren control area and is comparable to the affiliated facilities AmerenUE proposes to purchase from AEG;
- NRG is willing to sell its Audrain Facility at a price that is likely not greater than $391/kW, a figure that is substantially lower than the book value at which AEG proposes to sell its affiliated facilities to AmerenUE.
- AmerenUE's comparison of the book value of affiliated facilities with market prices at which similar generating plants were sold and purchased at market

prices -- even as recently as two years ago -- is dated, irrelevant and misleading due to drastic downturns in energy markets.

Q. Do you generally agree with the statements in NRG's FERC filing?

A. Yes.

Q. Specifically, do you agree with NRG's statement that "benchmark" data AmerenUE used for comparison is misleading and irrelevant?

A. Yes. The "benchmark" data that is repeated in the direct testimony of AmerenUE witness Richard A. Voytas has very limited value for the purpose of this proceeding and the way in which it is presented is misleading. A comparison of the book values of AEG's generating units with prices at which similar generating units were sold in the past does not indicate that those book values represent a fair market value of AEG's units at the present time. Those historic book values fail to reflect significant recent changes in the generation market in the United States, and specifically in the Midwest. The expected value of generating plants have fallen dramatically in response to lower energy prices, massive construction of new generation and reduced demand growth. Moreover, as AmerenUE itself points out, transmission constraints and other factors may impact the value of each generating unit, particularly with the locational pricing structure proposed for the Midwest ISO. Therefore, a comparison based simply on the book value, size and technology of those generating units is not sufficient for making a generation acquisition decision.

Q. Can you please provide an example that illustrates why book values do not represent the fair market value of a plant?

A. Certainly. An excellent example is NRG's Audrain Facility. In May of 2001, NRG purchased the Audrain plant at a price of $508/kW. Just two years later NRG now is willing to sell this plant at a price not exceeding $391/kW, or at least 23% below the price NRG paid in 2001.

Q. Is it a generally accepted electric industry practice to rely on the book value of plants when evaluating the economics of a proposed purchase or sale?

A. No. Looking at the book value of a generating facility is an inappropriate way to determine the fair value of that asset in the competitive market.

Q. Is there a more accurate method for comparing the value of different generating assets?

A. Yes. Rather than relying upon book values, there are much better ways to determine the fair market value of generating assets. Ideally, there would be a transparent, liquid market for such assets; however, such markets rarely exist. In the absence of a liquid market for generating facilities, an accurate method to compare the values of generating assets would be to use the results of a detailed regional modeling analysis to simulate the market relevant to the generating facility.

Q. Is it a common practice to rely on simulation modeling of electricity markets to obtain a value of a generating asset?

A. Yes. Participants in competitive electric markets routinely rely upon models to value assets. TCA has used this modeling approach for numerous clients in North America. We have applied our modeling methodology to value generation and transmission assets in virtually all regions of the United States and in a number of locations in Canada. Our clients include developers of new projects, buyers and sellers of generating assets, regulatory agencies and banks involved in project financing.

III.

MARKET SIMULATION METHODOLOGY, ASSUMPTIONS AND RESULTS

Q. Please describe the market simulation methodology TCA uses for valuation of generating assets.

A. Our market simulation methodology forecasts the operation of the asset being evaluated in detail. The critical output of such a forecast is the projected flow of costs and revenues accrued to the asset; those outputs are then used as an input to the financial evaluation model. Our market simulation methodology is driven by electricity market fundamentals: we start with the physical representation of the electrical grid which reflects both generation and load and how they are linked by transmission facilities. To implement this methodology, we use the GE MAPS software tool.

Q. Please describe the GE MAPS software tool.

A. GE MAPS is an industry standard modeling system. The GE MAPS software system was developed by General Electric and is being used by over twenty major utilities in the United States. It is the software system used to simulate the hour to hour operation, of an integrated, synchronous electric power system such as the Eastern Interconnection. (The United States is divided into three distinct electric power grids, one of which is the Eastern Interconnection, which includes Ameren's transmission system.)

GE MAPS determines the least-cost secure (in terms of assuring no chance of loss of load) dispatch of generating units to satisfy a given demand, on the assumption that the units are dispatched according to their short-run marginal costs. Over the past decade, TCA has worked closely with GE to improve the model's data structures and functionality to make it increasingly reflective of the competitive electricity market.

Q. Why is the GE MAPS model so widely utilized?

A. The major advantage of GE MAPS is its ability to simulate the hourly operation of generating units and transmission systems (e.g. transformers, lines, phase shifters, busses) in significant detail. For example, it accurately represents capacity constraints, minimum up and down time limitations for a generating unit, thermal constraints on the transfer capability of transmission lines, limits on transmission interfaces, line and unit contingencies and scheduling limitations of

hydro-plants. Thus, GE MAPS provides a highly accurate, detailed simulation of the hourly operation of the individual generating units and transmission system that constitute the wholesale electricity market.

Q. What is the scope of the analysis that you performed in the instant proceeding using GE MAPS?

A. In analyzing these three facilities, our GE MAPS simulations modeled a significant portion of the Eastern Interconnection including MAIN, MAPP, ECAR, SPP, SERC, FRCC and Ontario. Our simulations are based upon information for nearly 2,900 generating units, approximately 14,000 load busses and over 1,500 transmission constraints monitored by the model.

Q. Have you provided additional background information regarding the GE MAPS software tool?

A. Yes. Attachment 2.4, which is incorporated by reference, presents a more detailed description of the GE MAPS model. Attachment 2.5, which is incorporated by reference, provides a detailed description of the model structure, outlines input assumptions and specifies sources of input data. Attachment 2.6, which is incorporated by reference, specifically deals with the fuel price forecast underlying GE MAPS simulations.

Q. Please describe the outputs from the GE MAPS model.

A. Among the key outputs of the GE MAPS model are Locational Marginal Prices ("LMPs"), computed for each generation bus in each hour, and a set of capacity prices for each relevant geographical market. The LMP at a generating unit's location are used to forecast the revenues for that unit.

Q. What are Locational Marginal Prices?

A. LMPs represent the marginal cost of serving an incremental load at a load bus and the marginal cost of providing an incremental supply at a generator bus. Ignoring system losses, those prices vary by location if and only if there is transmission congestion in the system. In the absence of transmission congestion, LMPs in all locations are identical and equal to the short-run marginal cost of the marginal unit serving the entire system. If there is transmission congestion, there will be no single marginal unit for the entire system. Congested transmission lines could prevent a unit at one location from serving the load at another location. As a result, transmission congestion causes LMPs to vary by location. For example, if in a given hour, the LMP at a load bus exceeds the LMP at a generator bus, this indicates that transmission congestion limits the flow of incremental power from the generator to the load in that hour. Conversely, if LMP at a load bus is lower than the LMP at a generator bus, this indicates that transmission congestion exists in the opposite direction and that incremental power could be moved from the generating unit to serve the load without limitation.

Q. Are Locational Marginal Prices used in functioning electricity markets?

A. LMPs constitute the real price formation mechanism currently in use in electricity markets in PJM, New York and New England. LMPs are also the pricing mechanism contemplated by the Standard Market Design rulemaking proceeding being conducted by FERC. It is my understanding that the Midwest ISO ("MISO") market will also operate as an LMP driven electricity market starting in the first quarter of 2004, and that Ameren plans to join the MISO.

Q. Given that currently none of the generating units in question are being operated under the LMP regime, is it appropriate to value those generating units using the LMP driven market simulation methodology?

A. Yes. Even though Ameren has not yet joined the MISO, the LMP driven methodology is appropriate for several reasons. First, for the purpose of this analysis, we have evaluated all three generating units as if they are to be purchased in 2004, when the MISO market is expected to become operational. Second, although AmerenUE proposes to add the units to its rate base, it is reasonable to assume that it will operate those units in a manner that is consistent with the MISO rules and, more generally, within the logic of an efficient electricity market. Because an LMP market system identifies the least-cost means to operate generation subject to transmission constraints, it is reasonable to assume that Ameren will operate its units consistent with an LMP driven market. Further, the LMP driven methodology accurately identifies transmission

constraints and their costs, allowing accurate comparisons of transmission congestion for different generating facilities.

Q. Please explain how you used LMPs to assess the ability of each generating facility to serve Ameren's load.

A. We performed five individual year-long runs of the GE MAPS model for years 2004, 2006, 2008, 2011 and 2014. For each year-long run, the model reported hourly LMPs for each facility location as well as the load-weighted average LMP for the Ameren service territory.

Q. What were the results of your analysis?

A. There is no "locational" reason to favor the AEG Facilities over NRG's Audrain plant. That is, there is no transmission constraint that would impede AmerenUE from using the Audrain plant, and there is no meaningful difference in the LMPs between the various plants.

The comparison of the LMPs at each facility with the load weighted average LMP[1] for Ameren are contained in Attachment 2.3. Page 1 of Attachment 2.3 shows this comparison on average for the year. A similar comparison of on-peak hours during summer months in each year is shown on page 2 of Attachment 2.3. Both comparisons indicate that the LMP at each facility is either higher than, or almost identical to, the price of serving Ameren's load. This indicates that the

[1] Using the average load price in this context is appropriate because under the proposed MISO structure loads will be paying zonal prices. Zonal prices will be computed as load-weighted averages of LMPs.

model simulations detected no transmission constraints that would impede any of the three generating facilities from serving Ameren's load. Moreover, LMPs at Audrain are very close to those at Kinmundy and are just marginally above those at Pinckneyville. In sum, GE MAPS simulations clearly demonstrate that the Audrain plant represents a capacity option that has no locational disadvantage relative to the proposed affiliated facilities.

Q. What other outputs from GE MAPS simulations did you use in your analysis?

A. A summary of output results for each generating unit for each year is presented in Attachment 2.7, which is incorporated by reference. These output results include:

- Annual generation by unit;
- Annual energy and spinning reserves revenues based on unit-specific LMPs;
- Capacity revenues based on MAIN region specific capacity prices (all units are located within MAIN); and
- Annual variable generation costs (fuel and non-fuel O&M costs).

These results are used as inputs to the financial model used for asset valuation discussed in Section IV of this testimony.

Q. Please describe the specific input assumptions with respect to generating facilities you evaluated in your analysis.

A. We modeled the three sets of generating units using the same set of standard assumptions we typically use for new generating units utilizing simple cycle gas turbines. These assumptions are summarized in Table 1 below:

Table-1 Assumed Simple Cycle Gas Turbine Power Plant Characteristics

Heat Rate	10,000 Btu/kWh
Forced Outage Rates	4%
Planned Outage Rates	3%
Fixed O&M Cost	5-5.25 ($/kW-yr)
Variable O&M Cost	2.50 ($/MWh)
Quick Start Capability	100% (of total capacity)
Spinning Reserve Capability	90% (of total capacity)

Q. What capacity did you assume for each facility?

A. My assumptions were as follows:

- Kinmundy: a set of two generating units of 116 MW each;
- Pinckneyville: a set of four generating units of 44 MW each and four units of 35 MW; and
- Audrain: a set of eight generating units of 80 MW each.

For the purpose of this analysis, we assumed no distinction between summer and winter capacity for all three sets of units, because we had no specific data for the Ameren Facilities. However, making an explicit distinction between summer and winter capacity would unlikely make any significant impact on an estimated per kW value of the unit.

Q. Please elaborate on your assumption that all evaluated generating units have the same heat rate of 10,000 Btu/kWh.

A. This is the standard assumption in our GE MAPS database for all generating units utilizing the simple cycle technology and installed after 1998. While we recognize that some facilities of that type might have somewhat higher heat rates while others might have slightly lower heat rates, at present TCA does not have

this information on a unit-by-unit basis. Moreover, Ameren's application and supporting materials provide no data on specific heat rates of its generating units.

Q. Would it be reasonable to use precise heat rates of Ameren's and NRG's generating units for the purpose of this analysis?

A. Not necessarily. It is only reasonable to use precise heat rates of these generating facilities if precise information is available for all other peaking units with which those facilities compete in the market. Using precise heat rates for a selected generating unit and imprecise heat rates for other units would result in inaccurate modeling results and biased conclusions. Indeed, if we assume that a particular unit has a heat rate below 10,000, this unit will receive a "preferential" treatment by the GE MAPS dispatch algorithm (because all competing units have a heat rate higher than this unit's heat rate of 10,000), whereas in reality this may not be the case. Similarly, if we assume that the unit has a heat rate above 10,000, the GE MAPS dispatch algorithm would put this unit of disadvantage because all competing units have a heat rate lower than this unit's heat rate of 10,000. Again, such a result would not be realistic. Thus, for the purpose of this analysis, I believe that it is reasonable for similar generating units to be modeled at the same heat rate.

IV.

ASSET VALUATION METHODOLOGY, ASSUMPTIONS AND RESULTS

Q. Please describe the methodology you used to value each generating unit.

A. The results of GE MAPS simulation served as an input to a specialized asset valuation model. This asset valuation model calculates the market value of each generating unit as a net present value of the after-tax cash flow for that unit over a 21 year period from 2004 through 2024.[2]

Q. Please explain how the after tax cash flow for a unit is determined in the model.

A. All calculations in the model are performed on a per kW basis. The after-tax cash flow is calculated as a sum of the taxable income and depreciation less capital expenditures less income taxes.

Taxable income is calculated as net pre-tax revenues less tax depreciation, less property tax and insurance. The net pre-tax revenues are equal to annual revenues received from selling into wholesale energy markets (energy, capacity and ancillary services) less variable O&M costs, less fixed O&M costs. As explained earlier, the forecast of annual revenues and costs by generating unit are outputs from GE MAPS simulations.

[2] We ran GE MAPS for five years – 2004, 2006, 2008, 2011 and 2014. For years in between, the results were interpolated. Beyond 2014 we assumed the market to be at equilibrium resulting in the stream of costs and revenues measured in real dollars for all generating units to remain as simulated for 2014.

Q. What assumptions were used with respect to the depreciation schedule?

A. I assumed the level of depreciation of each unit each year from the perspective of a new owner with the unit being fully depreciated over a 15 year period. For that purpose, I used the IRS approved depreciation schedule (IRS Publication 946).

Q. How did you estimate unit-specific capital expenditures?

A. I estimated annual capital expenditures for each generating unit at 10% of its annual fixed O&M costs. This is the assumption we typically use in all our asset valuation projects. We have discussed this estimate with virtually every client of ours and so far have received no objections with respect to its validity.

Q. What did you use as a discount rate in calculating the net present value of the after-tax cash flow?

A. The after-tax Weighted Average Cost of Capital ("WACC") was used for AmerenUE's discount rate. The values for components of the WACC were obtain by using data from AmerenUE's filing before the Commission in Docket No. 00-0802. In doing so, two valuation scenarios were developed:

- Scenario 1 is based on the WACC structure as approved for AmerenUE by the Commission in that Docket – WACC of 9.04% corresponding to the After Tax WACC of 7.82%; and
- Scenario 2 is based on the WACC structure as proposed by AmerenUE in that Docket – WACC of 10.81% corresponding to the After Tax WACC of 9.66%.

Q. Please summarize your results.

A. The summary of my results is presented in Attachment 2.2. As shown in that exhibit, on a per kW basis, all three sets of generating units have nearly identical values under both scenarios. Under Scenario 1, all facilities are valued within the $380/kW to $387/kW range. Under Scenario 2, all facilities are valued within the $319/kW to $325/kW range. What is important about those results is that under both scenarios the estimated market value for Ameren's facilities is well below the book value at which Ameren proposes to transfer them to its regulated arm. This is most visible for the Pinckneyville plant, whose market value represents only three quarters of its book value under Scenario 1 and only two thirds of its book value under Scenario 2.

Q. What are your conclusions from this portion of your analysis?

A. My conclusions are as follows:

- The current market value of the Pinckneyville and Kinmundy generating facilities is substantially below the book value of these generating units. In other words, if the proposed transaction is approved, AmerenUE would pay substantially more that it would be anticipated to pay if it were to enter into an arm's length transaction with a third party.
- On a per kW basis, the market values of each of the three sets of generating facilities are virtually indistinguishable.

Q. What is your recommendation?

A. Based on the transmission system and the fair market value analyses, the Illinois Commerce Commission should reject AmerenUE's petition for authorization to purchase the AEG Facilities at their book value, because the book value does not represent a fair market price of those assets. The proposed transaction would result in AmerenUE paying more than it would pay for those assets in an efficient transaction in the competitive generation capacity market. Given the lack of any "locational" distinction between the AEG Facilities on the one hand and the NRG Audrain Facility on the other, it appears that AmerenUE's best option would be to acquire the least cost assets. Given the price suggested by AmerenUE in its petition for the AEG Facilities, and the price noted by NRG Senior Vice President Ershel C. Redd, Jr. in his direct testimony in this proceeding, it is clear that the NRG Audrain Facility is the least cost option.

Q. Does this conclude your testimony?

A. Yes.

List of Attachments

Attachment 2.1	Resume of Aleksandr Rudkevich
Attachment 2.2	Summary of Asset Valuation Results
Attachment 2.3	Analysis of Congestion Costs
Attachment 2.4	Description of the GE MAPS Model
Attachment 2.5	Modeling Assumption and Data Sources
Attachment 2.6	Fuel Price Forecast
Attachment 2.7	Summary of GE MAPS results